Petroleum Products Sampling Procedures and Safety Manual



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Petroleum Products Sampling Procedures and Safety Manual

I. Purpose and Scope

This manual has been designed to assist you in conducting inspections of petroleum products and contains procedures for:

- C Handling Products and Safety
- C Inspection
- C Sampling
- C Ordering Products Off-Sale

One purpose of the manual is to provide uniform inspection, sampling, and enforcement procedures for petroleum products in order to protect consumers and businesses from economic loss resulting from substandard products. The manual is also intended to help you avoid injury when you are handling petroleum products.

This manual does not purport to address all of the safety problems associated with the use of petroleum products. It is the responsibility of each agency to establish appropriate safety and health practices.

II. Petroleum Products Handling and Safety

A. Introduction

One of the primary considerations a person must have while at work is safety. Certain occupations carry varying degrees of potential hazards particular to the type of work, the tools involved, and the products encountered while at work. For individuals who sample and test petroleum products, the materials that may be encountered on a day-to-day basis not only may have potential toxic effects, but may be explosive and flammable. The best protection is to learn and observe the correct safety rules for the job and to use common sense. This manual provides some guidelines for properly and safely conducting specific tasks. You also should know and follow the safety requirements established by your agency and the safety rules in effect

at the location where you are testing.

B. Safety Equipment

The following is a list of some of the safety equipment that an inspector of petroleum products might use:

- 1. Eye-wash kit filled with fresh water.
- 2. Eye protection safety goggles.
- 3. Protective gloves impervious to gasoline, diesel fuel, kerosene, or fuel oil.
- 4. Fire extinguisher, dry chemical, rated for class "A," "B," and "C" fires, with current inspection tag Be sure you know how to use it! Reference NFPA 10, "Portable Fire Extinguishers," for additional guidance on selection of an appropriate fire extinguisher.
- 5. Hazard reflector kit (plastic type, non-burning). **Do not** carry or use road flares.
- 6. Bag of absorbent material (e.g., sand, kitty litter) to minimize flammability and environmental impact in the event of a petroleum product spill.
- 7. Barrier cream and waterless skin cleanser.
- 8. First-aid kit.
- 9. Reflective vest.
- 10. Flashlight explosion proof; UL listed for Class I, Groups C & D.
- 11. Tools made of nonferrous materials.
- 12. Activated carbon canister respirator

You should ensure that your safety equipment is maintained in proper working order at all times. A safety equipment inspection form, such as the one shown in Appendix A, can be used to facilitate periodic evaluation of the condition of safety equipment. The form should be completed at least on a <u>monthly</u> basis and submitted to your supervisor or safety officer. Any problems with safety equipment should be noted on the form and corrective action taken immediately.

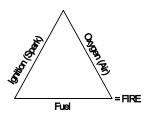
C. Gasoline - General

The primary petroleum product encountered in the field is gasoline. When you handle this product, remember the following.

- Gasoline is Harmful or Fatal if Swallowed
 - C Never siphon gasoline by mouth.
 - C If someone swallows gasoline, do not induce vomiting Call a doctor immediately.
- 2. Gasoline Vapor is Harmful; Long Term Exposure to Vapor Has Caused Cancer in Laboratory Animals
 - C Avoid prolonged breathing of gasoline vapor. Use gasoline only in an area where there is plenty of fresh air. When taking samples, place yourself upwind so vapors are blown away from you. Keep your face away from any gasoline container opening.
 - C If you must work in a high vapor concentration situation, such as when you are emptying sample cans, wear a protective mask with an organic vapor cartridge. Masks should be available at each petroleum laboratory for use by petroleum personnel.
 - C Keep gasoline containers closed when not in use.
 - C Do not overfill or top off a gasoline tank. Make sure the cap is put back on when the gasoline tank has been filled.

- 3. Avoid eye and skin contact
 - C Use of a barrier cream is advised.
 - C Have eye-wash bottles available in case petroleum products are splashed into your eyes. If you get gasoline in your eyes, flush them for 15 minutes with clean water. If irritation continues, see a doctor.
 - C Never use gasoline to wash your hands.
 - C Rubber or plastic gloves which are impervious to petroleum liquids should be worn.
 - C If you get gasoline on your skin, wash promptly and thoroughly with soap and water.
 - C Remove gasoline-soaked clothes, dry them in open air (away from heat sources), and then launder them before re-using.
- 4. Gasoline is extremely flammable
 - C Use only as an engine fuel. Do not use for cleaning, pressure appliance fuel, or any other such use.
 - C Do not use or store near flames, sparks, or hot surfaces.
 - C Keep containers closed clean up spills immediately.
 - C Be aware that gasoline presents an extreme fire hazard. Liquid evaporates very quickly, even at low temperatures, and forms vapor (fumes) which can catch fire and burn with explosive violence.
 - C Realize that invisible fuel vapor is heavier than air and spreads easily and can be ignited by sources such as pilot lights, welding equipment, electric motors, and switches.

Remember the Fire Triangle:



Removing any side of the triangle will prevent or eliminate a fire.

D. Static Electricity

No safety manual regarding potentially explosive liquids would be complete unless this hazardous subject was addressed. Static electricity or any spark, regardless of its source, can ignite gasoline vapors, propane, and other volatile liquids and gases. This potential hazard should be kept in mind when sampling and handling these types of products.

Tank trucks and other rubber-tired vehicles are potential generators of static electricity. An accumulation of this static electricity is often demonstrated by electrical sparks when a person touches the body of the vehicle, or by a slight shock when entering or leaving the vehicle.

When sampling products described in this manual, always ensure that a solid metal-to-metal bond is made between a fill nozzle and your sample can to reduce the risk of this potential hazard. Do not fill the sample container while it is in contact with a plastic-lined pickup bed or the trunk of an automobile.

For a more detailed guide on the hazards of static electricity, refer to ASTM D 4865, "Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems." This publication describes in detail how static electricity may be generated in petroleum fuel systems, the types of equipment conductive to charge generation, and methods for the safe dissipation of such charges. The guide is intended to increase awareness of potential operating problems resulting from electrostatic charge accumulation.

E. Recommended Safety Precautions for Transporting Petroleum Samples

- 1. Use suitable sample containers Samples should be collected and transported in a suitable container which can be tightly closed. Sample containers should not be filled above 80 percent of capacity to allow for expansion of the liquid sample.
- 2. Do not transport samples in the passenger compartment of vehicles. Petroleum sample containers should be placed in a closed metal box and properly secured in the trunk of a sedan or bed of a pickup for transportation.
- 3. Have a suitable fire extinguisher available A dry chemical type rated for class "A," "B," and "C" fires is the most effective extinguishing agent for flammable liquid fires.
- Control accidental spills Carrying sample containers in a metal box will contain a spill or accidental leak from a sample container.
- 5. In case of a collision or vehicle breakdown, do not use burning emergency flares. Emergency reflectors are recommended.
- 6. Store samples in fireproof cabinets away from sources of ignition.
- 7. Smoking in vehicles used to transport petroleum samples is not recommended.

F. Spills, Containment, and Clean Up

- Gasoline Eliminate all sources of ignition in the vicinity of the spill. Clean up small spills using appropriate techniques such as absorbent materials and/or suction pumps appropriate for liquid petroleum product clean up. Place recovered gasoline in approved container for proper disposal.
- Diesel and Fuel Oil Soak up residue with absorbent material such as clay, sand, or other suitable material. Place in non-leaking containers and seal tightly for proper disposal. Flush area with water to remove trace residue. Properly dispose of flush solution.

3. Kerosene - Take up with an absorbent material and place in a sealed container for proper disposal.

If product spills onto soil, where feasible and appropriate, remove contaminated soil and/or contact local environmental authorities.

G. Material Safety Data Sheets

Federal and State laws require vendors of hazardous products to provide purchasers with a Material Safety Data Sheet (MSDS) for any hazardous product purchased.

MSDS's provide valuable information about materials, ranging from general product data to specific details on the health hazards and first-aid procedures applicable in case of spills or exposure. They also contain reactivity data, which is important because many materials will react, sometimes violently, with other substances such as strong acids.

You should have copies of the MSDS's for use in the field. In addition, they should be kept in each petroleum laboratory for review when needed. The MSDS's should be neatly arranged in notebooks or files, and one individual should be given the responsibility of keeping the information up to date.

You should review the MSDS's at least semiannually (e.g., June and December). A record should be kept of this review on a form such as the one shown in Appendix B; you should initial and date the form when you complete your review. First-line supervisors or safety officers should have the responsibility of ensuring that the reviews are completed in a timely manner.

Listed below are materials found in the laboratory and in the field for which MSDS's should be obtained.

Materials Encountered in the Petroleum Laboratory

Acetone

Acetylene

t-amylmethylether (TAME)

Benzene

Buffer solution - 10 pH - sodium chloride, sodium tetraborate, potassium chloride and sodium glycinate

Buffer solution - 7 pH - dibasic sodium phosphate, monobasic potassium phosphate, dibasic potassium phosphate

Buffer solution - 4 pH - hydrochloric acid, potassium hydrogen phthalate, formaldehyde

Butyl alcohol, normal

sec-butyl alcohol

t-butyl alcohol

Calcium sulfate

Compressed air

Compressed Natural Gas (CNG)

Diesel fuel

Diisopropylether (DIPE)

1,2 Dimethoxyethane

Ethyl alcohol (Ethanol)

Ethyl *t*-butylether (ETBE)

Ethylene glycol

Fuel oil

Gasoline

Gasoline-oxygenated blend

Glycerin Potassium dichromate

Helium Potassium hydroxide

Heptane, normal Precipitation naphtha (aliphatic hydrocarbons)

Hexane, normal Pressure appliance fuel

t-hexylmethylether (THeME) Propylene glycol

Hydrochloric acid Sodium hydroxide

Hydrogen Sulfuric acid

Iodine Toluene

Isobutyl alcohol Xylene

Isooctane (2, 2, 4 trimethylpentane) Materials Encountered During Field Work

Compressed Natural Gas

Isopropyl alcohol Diesel Fuel

Kerosene Gasoline

Lead in reference fuel (tetraethyl-lead and Kerosene

2,2,4 trimethylpentane)

Liquefied Natural Gas (LNG)

Liquefied Natural Gas

Mercury

Liquefied Petroleum Gas Methyl alcohol (Methanol)

Water Indicating Paste Methyl isobutyl ketone

Ethanol

Methyl *t*-butylether (MTBE)

Methanol

Methylene chloride

Fuel Oil Mineral oil

Pressure appliance fuel

Nitric acid

Nitrogen (gas) III. Inspection Procedures

Nitrogen (liquid)

The suggested procedure for routine service station inspections is:

t-pentyl alcohol

1. Identify yourself to the owner or manager and state

the nature of your business.

- 2. Record the business name, address, and telephone number, and the name of the owner/operator.
- 3. Check the labeling on all petroleum product dispensers, containers, and storage tanks for diesel and gasoline.
- Obtain all necessary evidence (such as photographs, drawings, samples, product level and totalizer readings, and statements) for use in any possible administrative or judicial proceeding.

The following is an example of an inspection check list:

CHECK LIST

 Showed credentials?
 Recorded information on business?
 Checked for sign and label violations?
 Diagram of dispensers?
 Diagram of underground tank locations?
 All dispensers inspected?
 Samples collected?
 Product level and totalizer readings taken?
 Chain of custody procedures followed?
 All relevant areas of sample form filled in?
 Samples packed for transportation?
 All samples paid for?
 Copy of form left with someone at the site, if required?
 Flushed gasoline returned to storage or placed into a vehicle?

IV. Sampling Procedures

Extreme care and good judgement are necessary to ensure samples are obtained that are representative of the product being sold. It is necessary to protect all volatile samples of petroleum products from evaporation. In most circumstances, the product sampled should be put directly into a sample container as it is obtained. This is mandatory for vapor pressure samples. When it is necessary to obtain product with a sampling apparatus, such as from an underground storage tank, transfer the product to a sample container immediately. Keep the container closed except when material is being transferred. Never completely fill a sample container; allow adequate room for expansion. To prevent the loss of liquid and vapors during transport, screw the caps of containers down tightly and check for leakage. Label and seal the containers immediately after the sample is obtained.

A. Types of Samples

There are two reasons for obtaining samples:

- 1. Routine samples these are samples collected in the normal course of business to verify compliance with established specifications.
- 2. Complaint samples these are samples that are collected in response to a consumer or business complaint.

Samples can be obtained in one of two manners:

- 1. Open Samples you enter the station and identify yourself, state the reason for being there and obtain the necessary sample(s).
- 2. Undercover Samples you obtain a sample(s) of the product(s) in question without announcing yourself to the station operator/owner. This can be done by means of a "trap tank" in an undercover vehicle or by purchasing the product into a UL or FM listed, approved gasoline container as though it were for a lawn mower.

B. Types of Sample Containers

Sample containers may be clear or brown glass bottles, aluminum bottles, or metal cans. The clear bottle is

advantageous because it may be examined visually for cleanliness, and also allows visual inspection of the sample for free water or solid impurities. The brown glass bottle affords some protection from light. Plastic coated bottles are available which provide protection against shattering. The only suitable metal cans are those with the seams soldered on the exterior surface with a flux of rosin in a suitable solvent that is easily removed with gasoline or seamless aluminum bottles. NFPA 30A 9.2 (1994 edition) states "No delivery of any Class I or Class II liquid shall be made into portable containers unless the container is constructed of metal or is approved by the authority having jurisdiction, has a tight closure, and is fitted with a spout or is so designed that the contents can be poured without spilling." If a jurisdiction is operating in an area where NFPA requirements are adopted, this should be considered in selecting sample containers that will be used at retail locations. Screw caps made of either plastic or metal may be used; the caps should provide a vapor tight closure seal. The screw caps must be protected with liners made of metal foil, teflon, polyethylene, or other material that will not be destroyed by or affect the sample product. Sample containers can be cleaned and used repeatedly as long as they are still serviceable. The caps should be used once and then disposed of, this will help prevent leakage and loss of reliability of the sample.

C. Suggested Container Types and Minimum Sample Sizes

As a general rule, a sufficient amount of product should be collected to allow for the initial test, a repeat test, and retention of some product for evidence in a possible legal action. Some suggested container types and minimum sample sizes are listed below:

ASTM D 5842 "Standard Practice for Sampling and Handling of Fuels for Volatility Measurement" is an acceptable sampling procedure that is applicable to both retail and wholesale sampling.

Product/Test	Container Type*	Minimum Sample Size
Gasoline		•
General	Aluminum, Glass,	
	or Metal	2 L
Alcohol/Ether	Aluminum or Glass	2 L
Vapor Pressure	Aluminum or Glass	1 L
Trace lead	Aluminum or	
	Borosilicate Glass	1 L

*Do not use aluminum sample bottles for methanol fuels - pure methanol, M70 or M85.

Diesel Fuel				
General	Aluminum, Glass, or Metal	2 L		
Kerosene				
General	Aluminum, Glass, or Metal	2 L		
Fuel Oil				
General	Aluminum, Glass, or Metal	2 L		
Aviation Gasoline				
General	Aluminum, Glass, or Metal	2 L		
Aviation Turbine F	uel			
General	Aluminum, Glass, or Metal	2 L		
Liquefied Petroleum Gas (LPG)				
General	Floating piston cylinder	1 L		

D. Collecting Samples

When collecting samples at a retail location, follow procedures in 40 CFR Part 80, Appendix D. At wholesale locations, collect samples in accordance with ASTM D 4057, "Standard Practice for Manual Sampling of Petroleum and Petroleum Products." Additionally.

Use a sample container which is clean and free of water, dirt, lint, corrosion, rust or other visible contamination. Exercise care when obtaining samples to ensure that your sample is representative of the product to be tested.

Sufficient product should be purged from the system to ensure that you are obtaining fresh product. The sample container should be rinsed with the product that will be sampled immediately prior to collecting the sample to ensure all possible contaminants are removed.

It is necessary to protect all volatile samples of petroleum products from evaporation. It is important that samples sensitive to light be kept in the dark. **Do not over fill** allow room in the sample container for product expansion. As a general rule the container should be filled to no more than 80 percent of capacity. In 40 CFR Part 80, use of an extender tube to bottom fill the sample container is required in the case of samples that will be analyzed for vapor pressure.

Seal the sample container tightly, complete and attach the sample tag/chain of custody tag (if required to be attached) and affix the security seal. Use reasonable care to keep the sample container away from excessive heat and light. Submit only samples collected by authorized personnel. Do not collect a sample for enforcement purposes from private storage, vehicle fuel tanks, etc. You can not attest to such sample as being truly representative of the product which is being sold.

E. Sampling From Blended Product Dispensers and Single Hose Multi-Product Dispensers

When taking gasoline samples from these dispensers, the samples should be collected after an observed sale of the particular grade or product to be tested, or sufficient product should be purged from the hose to ensure the sample is representative of the grade or product being sampled. The National Conference on Weights and Measures policy on procedures for taking samples for octane verification is as follows:

"A minimum of 1 liter (0.3 gallon) of engine fuel shall be flushed from the dispensers before taking a sample for octane verification. This flush shall be returned to the storage tank containing the lowest octane."

The approximate volume of the listed hose sizes per 3 meters (10 ft) of hose is:

Inside diameter Approx. Liters (gal)/3 m(10 ft)

13 mm (½ in)	0.4 L (0.10 gal)
16 mm (5/8 in)	0.6 L (0.16 gal)
19 mm (3/4 in)	0.8 L (0.23 gal)
25 mm (1 in)	1.6 L (0.41 gal)

F. Identifying Samples and Sealing Containers

You must be able to verify or authenticate your samples in court. A petroleum products sample tag should be completed for each sample and permanently affixed to the container (if required). Containers should be sealed as follows:

1. Metal cans with security seals - The top opening of the container should be closed <u>tightly</u> with a screw cap. The closure should then be sealed with a security seal should be attached as shown in Figure 1.

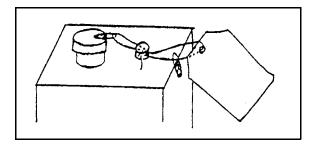


Figure 1. Attachment of Security Seal.

The petroleum products sample tag should be attached to this side of the seal. All slack should be removed from the circuit prior to securing the seal. Check screw cap for tightness to ensure that there are no leaks. Pull security seal tight to secure it.

NOTE: Seals are attached in this manner so that they may be cut to permit laboratory analysis while the petroleum products sample tag will remain permanently affixed to the container.

2. Glass bottles with adhesive paper seals - The top opening of the container should be closed <u>tightly</u> with a screw cap. The closure should be sealed with an adhesive paper seal attached as shown in Figure 2.

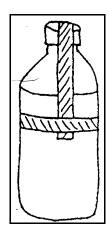


Figure 2.
Attachment of Security Seal.

The seal should be placed over the cap and down the sides of the bottle to seal the cap. One (or more if necessary) additional seals should be placed around the bottle overlapping the ends of the seal across the cap.

3. Aluminum bottle with tamper evident, screw cap the top opening should be sealed with a polyethylene plug and closed tightly with a locking screw cap as shown in Figure 3.

Fig ure 3 Alu m i num bot t l e wit h plu g a n d mper t a evident locking screw cap.

G. Procedure for Transmittal to Laboratory

Engine fuel samples should be shipped to the petroleum laboratory if delivery by program personnel is not practical. Department of Transportation (DOT) regulations regarding the shipment of hazardous substances should be consulted for proper packaging and labeling before shipment. There will obviously be variants to any routine delivery system. However, in general, you need to make some definite arrangements for delivery.

Examples might be:

- C Ask area official to pick up sample.
- C Deliver sample via another program's personnel.
- C Deliver sample to a certain pickup point.
- C Ask State courier to pick up sample.
- C Arrange for common carrier to pick up sample.

Some private carriers have requirements for shipping that are more restrictive than DOT regulations. These requirements could influence the type of sample containers that can be used, in addition to packing materials required. Additionally, some private carriers require that the individuals preparing and packaging the sample for shipment be trained and certified according to DOT criteria. If common carriers are used for shipment of samples, contact the individual company for specific packing and shipping requirements.

A sample left in an office or vehicle for any length of time has lost its reason for priority handling due to new deliveries having been made to the service station and other factors.

H. Chain of Custody (Possession) and Custody Transfer

Chain of Custody (Possession) is a record of each person who has come into possession of the sample from the time it is obtained until the time it is presented as evidence in an administrative or judicial proceeding. It may be the only way to prove that the sample presented in the proceeding is the one obtained at the location in question.

It becomes mandatory that a record be maintained which

lists all those persons coming in contact with the evidence. This is particularly true when a scientific analysis of the sample is to be made. It must be proved that there was no tampering with, alteration of, or substitution of the sample between the time it was collected and the time the analysis was made by the laboratory. The burden of proof is on the party offering the sample into evidence.

Samples must be passed from the field person who obtained them to the laboratory personnel. When this takes place, the record must indicate to whom and when the sample was released. In other words, the chain of custody must be maintained. This means that the transfer of the sample must be documented each time, and that the record must remain with the sample. If this proof is not available, the sample and its analysis may be excluded from evidence.

Although an accurate and complete record is maintained of the chain of custody, it is still highly advisable that the samples go through as few people as possible. The fewer people involved, the less chance there is the sample may be tampered with, altered or lost. Also, fewer witnesses will be needed to be called to establish the fact that the sample analyzed is the sample collected at the location.

I. Timeliness of Samples

A sample that fails to arrive at the laboratory within 2 days for analysis is usually of little value in preventing low octane or contaminated engine fuel from being sold to the public. This is because of the fast turnover of dealers' inventories in today's market.

V. Off-Sale Procedures

Engine Fuel Off-Sale Guidelines

- Upon notification from the laboratory that a product sample did not meet specifications, go to the location where the product was obtained and identify yourself to the manager or person in charge.
- 2. Explain what the test results on the sample were, what the specifications for that product are, and what action you are going to take. Refer questions on the test results to the appropriate laboratory or management personnel. **Do not** recommend how to

correct or bring the bad product into specification.

- Read the pump totalizers and determine the number of gallons in the storage tank from which the sample originally was collected; also check to see if there is water in the tank with water-finding paste and record the amount.
- 4. If additional product has been added to the storage tank since the sample was collected, resample the product, and properly label and seal it.
- 5. If no additional product has been added to the storage tank since the sample was collected, label and seal the storage tank fill pipe(s) and/or product dispenser(s) for the grade of product in question in accordance with the procedures in your jurisdiction.
- 6. Explain to the manager your jurisdiction's policy on the disposition of off-sale product. Leave a written copy of your instructions with the manager. (See Figure 4.)
- 7. When the storage tank(s) are to be pumped out, check the tags and seals to see that they are intact. Also check the totalizer readings and measure the amount of product in the tank to determine if product has been removed. Break the seals and allow the product to be pumped out of the storage tank. Have the lines and filters flushed with sufficient good product to assure all off-specification product is removed before releasing for sale.
- 8. Obtain a sample of replacement product from the delivery truck and of the new product through the dispenser after it has been dumped into the storage tank.

In accordance with the provisions of
Section of the
Code, please be
advised that on at
o'clock,m., I will be
prepared to properly dispose of the
products condemned and sealed by
officials of the Department of
Weights and Measures on,
at
I request that a representative of the Department of Weights and Measures be present at the above noted address at the time specified to remove all seals and required sealing notices, and to supervise the removal and disposition of the condemned products.

Off Sale Product Disposition Letter

Figure 4. Sample Off-Sale Disposition Letter

9. Take the appropriate enforcement action (issue a Notice of Violation, or citation, etc.) with a responsible party.

VI. Referenced Documents

The following documents are referenced in this manual:

ASTM D 4067, Standard Practice for Manual Sampling of Petroleum and Petroleum Products;

ASTM D 4865, Standard Guide for Generation and Dissipation of Static Electricity in Petroleum Fuel Systems;

ASTM D 5842, Standard Practice for Sampling and Handling of Fuels for Volatility Measurement;

40 CFR Part 80 (Vapor Pressure Control Standards issued by the U.S. EPA under the authority of the Clean Air Act);

NFPA 10, Portable Fire Extinguishers;

NFPA 30A, Automotive and Marine Service Station Code.

	Safety Equipment Inspection	
TO:	Date:	
Office:		
Absorbent Material		
Eye Protection		
Eye-Wash Bottle - Date fill	ed with clean water	
Fire Extinguisher	Exp. Date:	
First-Aid Kit		
Replacement Items Require	d (First-Aid Kit)	
Gloves	Hazard Reflector Kit	
Reflective Vest	Vapor Proof Flash Light	
	Vehicle Lic. No.:	
Corrective Action Taken		

Safety Manual Appendix B.

MSDS LOG

I have reviewed the enclosed Material Safety Data Sheets (MSDS) on the dates indicated by my initials.

NAME	DATE-INIT.	DATE-INIT.	DATE-INIT.	DATE-INIT.